Hearing on

Drones: The Next Generation of Commerce?

Before the

Committee on Oversight and Government Reform
United States House of Representatives

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Testimony of

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Thank you, Chairman Chaffetz and Ranking Member Cummings. My name is Paul Misener, and I am Amazon's Vice President for Global Public Policy. Drones will provide the next generation of commercial delivery service, when permitted, so policymakers should expeditiously adopt rules of operation that emphasize drone safety and system performance. Thank you for your attention to this important topic; for calling this hearing; and for inviting me to testify.

I. Amazon Prime Air

Amazon Prime Air is a future service that will deliver packages of up to five pounds to customers in 30 minutes or less using small drones, also known as "unmanned aircraft systems" or "UAS." Flying beyond line of sight under 500 feet, and generally above 200 feet except for takeoff and landing, and weighing less than 55 pounds total, Prime Air small UAS vehicles will take advantage of sophisticated

"sense and avoid" technology, as well as a high degree of automation, to safely operate at distances of 10 miles or more, well beyond visual line of sight.

Not only do we think our customers will love this service, we believe it will benefit society more broadly. Once operational, Prime Air will increase the overall safety and efficiency of the current ground transportation system, by allowing people to skip the quick trip to the store or by reducing package deliveries by truck or car. For the same reasons, Prime Air will reduce buyers' environmental footprint: If a consumer wants a small item quickly, instead of driving to go shopping or causing delivery automobiles to come to her home or office, a small, electrically-powered UAS vehicle will make the trip faster and more efficiently and cleanly.

American commercial entities are innovating and perfecting small UAS ("sUAS") technology, and to do so we are conducting research and development testing. Amazon has a large indoor R&D facility in Seattle. In this facility, our Prime Air team (including roboticists, scientists, aeronautical engineers, remote sensing experts, and even a former NASA astronaut) continues to conduct flight tests on rapidly improving designs. But of course we also need to safely test these designs outdoors, exposed to the real world conditions that our sUAS eventually will experience in operations – namely, wind, turbulence, and a variety of temperatures, humidity, and precipitation. Amazon Prime Air has been conducting outdoor R&D flight testing in multiple locations abroad as well as in the United States, where the Federal Aviation Administration ("FAA") has taken steps to streamline grants of required approvals. Our testing is going well, and we are very pleased with the R&D progress it has enabled.

In addition to our R&D work, we also will prepare our distribution network for the eventual integration of Prime Air delivery service. Preparation will include optimizing our internal systems because, in order to meet our Prime Air customer delivery goal of 30 minutes or less, our sUAS must be loaded quickly, and this presents fascinating logistical challenges, including within our huge warehouses.

II. Public Policy Needs

No country in which we have distribution facilities has yet adopted rules that would allow commercial UAS package deliveries. So, in addition to our Prime Air R&D; testing; and distribution network preparations, we are working with government agencies to develop appropriate rules for small UAS operations. Such rules must allow sUAS operations to take advantage of a core capability of UAS technology: to fly with minimal human involvement, beyond the visual line of sight of a human operator. Such rules of operation should be proportionate to risk, setting a level of safety but not mandating how that level must be met.

Safety is Amazon's top priority – a top priority that I know we share with the FAA – and we are committed to mitigating the safety risks of mid-air collisions and crashes to the ground. In its Notice of Proposed Rulemaking ("NPRM") on sUAS, released earlier this year, the FAA emphasized concerns with the lack of human "see and avoid" abilities and the hazard of ground-to-air communications "link loss." Both of these factors would have been difficult to address even just a decade ago, but automated sUAS *sense* and avoid technology and vehicle on-board intelligence will in practice address these factors and mitigate the related risks.

Key aviation authorities outside the United States are rapidly pursuing regulatory frameworks and operational rules for UAS. Their approach is risk- and performance-based, and it is mindful of the tremendous opportunities for innovation and economic benefits that UAS present. The European Commission ("EC"), for example, has concluded that UAS vehicles should be treated as new types of aircraft with proportionate rules based on the risk of the operation ("rules should be simple and performance based"). The EC also said that rules must be developed now ("the basic regulatory framework should be put in place without delay"); that technologies and standards need to be developed for the full integration of UAS in the airspace; and that the European Aviation Safety Agency ("EASA")

should lead the harmonization of UAS regulation across Europe. For its part, EASA already has announced that:

> The operation of drones should be regulated in a manner proportionate to the risk of the specific operation. Considering the broad range of operations and types of drones, it is proposed to establish 3 categories of operations and their associated regulatory regime…. This concept has been developed to address two main goals: (a) Integration and acceptance of drones into the existing aviation system in a safe and proportionate manner; [and] (b) Foster an innovative and competitive European drone industry, creating new employment, in particular for SMEs.

Here in the United States, the FAA also is taking its UAS responsibilities seriously, and Amazon is grateful for the attention the agency is giving to this new, innovative technology. The FAA's sUAS NPRM is a step forward as it speaks to the need for a performance-based approach to rulemaking. We fully agree with this approach.

At the same time, the NPRM has shortcomings mostly because some of the prohibitions maintained are not actually performance-based and, if adopted as drafted, the rules would not establish a regulatory framework to permit Prime Air operations in the United States. Given the pace at which this technology is advancing, the FAA's proposed rules should more fully embrace and embody performance-based regulation that is flexible enough to keep up with advancements in technology. More specifically, we respectfully disagree with the FAA's current opinion that extending see-and-avoid principles to small UAS, as well as the potential loss of positive control of small UAS, present "unique safety concerns," which thereby warrant delayed consideration. Although these safety concerns present particular engineering challenges, to be sure, such challenges are not qualitatively different from other engineering challenges facing small UAS designers, so they should be assessed starting now, ultimately resulting in performance-based operating permissions. Overly prescriptive restrictions are likely to have the unintended effect of stifling innovation and, over time, will fail to offer any corresponding safety benefit as sUAS technology evolves. By contrast, genuine performance-based regulation would provide a flexible framework for

operators to demonstrate that these types of operations can be conducted safely. In sum, the FAA should consistently adopt a performance-based approach throughout its sUAS rules, and thereby not unnecessarily limit the promising benefits of small UAS technology.

A welcome intermediate development is the FAA's recently-announced "Pathfinder" project with BNSF railroad that is designed to conduct research to help determine how to safely fly beyond visual line of sight. Other similar research initiatives also would help the FAA become familiar with and evaluate UAS, but should not delay or distract from existing avenues for progress. One such avenue is uncertain because, although the FAA has asked a "working group" of one of its industry advisory committees to examine UAS operations beyond visual line of sight (and I am a member of this working group), it has met only twice since its inception last year, and not even once in 2015. This pace is inadequate, of course, especially compared to the regulatory efforts in other countries. Granted, regulators here and abroad cannot quickly adopt actual rules for operations beyond visual line of sight. That may take time. But American policymakers should quickly *propose* regulatory frameworks and rules for future commercial sUAS operations.

III. Opportunities for FAA and Congressional Action

The United States should immediately begin to plan and develop rules for sUAS operations that would encompass highly automated flight, beyond visual line of sight. Amazon believes that the FAA should act expeditiously, and asks that Congress provide legislative guidance to the agency and, if necessary, provide additional legal authority.

First and foremost, sUAS regulations must be risk- and performance-based. That is, sUAS rules should take into account the risks of operations (including, *e.g.*, the absence of passengers and crew, the lower kinetic energy of aircraft, and the very low operating altitude) and evaluate how UAS performance

mitigates these risks. Categorical prohibitions (*e.g.*, no nighttime operations, no operations beyond visual line of sight) make no sense and must be avoided. Importantly, sUAS with increased technical capabilities to detect and avoid aircraft, structures, and other obstacles should be permitted to operate beyond visual line of sight. Likewise, highly-automated UAS vehicles should be allowed to fly if they meet performance-based safety requirements, and thus a single sUAS operator should be allowed to oversee simultaneous operation of multiple highly-automated sUAS vehicles. Also, UAS should be permitted to transport property, including as an external load, for compensation.

Four other important considerations merit attention from U.S. policymakers. First, the FAA, working with industry and other parties, such as NASA, should develop a regulatory structure for commercial and other sUAS operations at low altitudes, say, below 500 feet above ground. Second, given the interstate nature of commercial sUAS operations, states and localities must not be allowed to regulate sUAS that the FAA has authorized, including with respect to airspace, altitude, purpose of operations, performance, and operator qualifications. Uniform federal rules must apply. Third, and similarly, internationally harmonized rules are highly desirable, and ideally would be developed through multinational aviation bodies like JARUS (the Joint Authorities for Rulemaking on Unmanned Systems) or ICAO (the International Civil Aviation Organization). Such harmonization should be an FAA priority. And fourth, commercial wireless spectrum, both licensed and unlicensed, and commercial wireless networks, managed by commercial wireless carriers, must be deemed adequate for sUAS communications functions, including for control links, collision avoidance, diagnostics, and payload communications.

One other consideration may require Congress to provide more than guidance to agencies. If sUAS operators were ever considered "air carriers," some statutory ownership restrictions may be impossible for operators to meet.

Consumer privacy is an area in which the U.S. approach to UAS regulation already is particularly strong. UAS technology could cause privacy infringement if commercial operations are not undertaken in a sensible, privacy-conscious manner. Prime Air is a future delivery service, not a surveillance operation, and we will respect the privacy of every person, with stringent privacy policies accessible to all. Amazon is committed to ensuring that the collection and use of information for Prime Air is consistent with our customer-centric values. We strongly support the effort of the National Telecommunications and Information Administration ("NTIA") to develop, through a multi-stakeholder process, best practices on privacy, transparency, and accountability, and we look forward to working with NTIA and other stakeholders to ensure that consumer privacy is protected as the consumer benefits of innovative UAS technology become available.

IV. Conclusion

In conclusion, Mr. Chairman, I look forward to working with you, your Committee, and the FAA to help the United States expeditiously adopt rules for sUAS operations that emphasize safety and system performance, thereby permitting drones to provide Americans the next generation of commercial delivery service safely and soon. Thank you. I welcome your questions.

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Paul Misener is Amazon.com's Vice President for Global Public Policy, and has served in this position for 15 years.

Both an engineer (B.S., Electrical Engineering and Computer Science, Princeton University, 1985) and lawyer (J.D., George Mason University, 1993; Distinguished Alumni Award, 2001), he is responsible for formulating and representing the company's public policy positions worldwide, as well as for managing public policy specialists in Asia, Europe, and the Americas.

Formerly a partner in the law firm of Wiley, Rein & Fielding, Paul also served as Senior Legal Advisor to a Commissioner of the U.S. Federal Communications Commission (FCC). Prior to this government service, he was Intel Corporation's Manager of Telecommunications and Computer Technology Policy, and leader of the computer industry's Internet Access Coalition.

In the late 1980s, Paul was a policy specialist for the U.S. Department of Commerce's National Telecommunications and Information Administration, where he was a U.S. delegate to several conferences of the ITU. Prior to that, he designed radio communications systems. In 2013, he chaired the technical subcommittee of the FAA's advisory committee on airplane passenger use of portable electronics. He currently serves on the FCC's technological advisory council and the FAA's beyond visual line of sight UAS (drones) working group.

Committee on Oversight and Government Reform
Witness Disclosure Requirement – "Truth in Testimony"
Required by House Rule XI, Clause 2(g)(5)

Name:
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1. Please list any federal grants or contracts (including subgrants or subcontracts) you have received since October 1, 2012. Include the source and amount of each grant or contract.

None

2. Please list any entity you are testifying on behalf of and briefly describe your relationship with these entities.

Amazon
Vice President, Global Public Policy

3. Please list any federal grants or contracts (including subgrants or subcontracts) received since October 1, 2012, by the entity(ies) you listed above. Include the source and amount of each grant or contract.

None

I certify that the above information is true and correct.
Signature: Paul E. Misener Date: June 12, 2015